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Book review

Cloud Optics. Kokhanovsky, A.A. Springer, Berlin (2006) (xii + 276pp., US$129, Hardbound, ISBN 1-4020-3955-7)

This book was published as volume 34 of the Kluwer/Springer series "Atmospheric and Oceanographic Sciences Library". The title of the book is ambitious, and one immediately wonders whether the topic of cloud optics can be covered comprehensively on just 276 pages. In fact, my impression is that the author hurries through much of the basic material in order to get quickly to specialized subjects of his own research interest. Unfortunately, this approach does not quite yield a thorough and systematic textbook that could be recommended to undergraduate or graduate students. The book has several deficiencies, some of which are listed below:

1. A more systematic and thorough presentation of basic information on the physics and chemistry of cloud formation and evolution would be very helpful to a novice in the field. It would place the book in a much better context and would make it more self-contained.
2. On page 1, it is stated that rain droplets can be deformed by the gravitational force. In fact, it is the aerodynamical force resulting from a non-zero droplet falling velocity that causes the deformation.
3. Essentially nothing is said about the optical properties of cloud droplets and crystals with inclusions (e.g., soot particles and air bubbles).
4. Section 1.2 would benefit from photographs illustrating the main cloud types. There is hardly any mention of contrails as a major anthropogenic cloud type.
5. Section 2.2 would benefit from a figure showing the basic geometry of light scattering.
6. Of all techniques for the computation of electromagnetic scattering by nonspherical cloud particles the author briefly discusses only the most basic form of the geometric optics approximation.
7. The book introduces the radiative-transfer equation (RTE) in the old-fashioned and outdated phenomenological way. Since the derivation of the RTE directly from the Maxwell equations already exists, the introduction of Eq. (3.1) as a basic experimental fact is superficial and deceptive, especially to a novice. Furthermore, the way in which the RTE is introduced is quite misleading since it implies that the intensity and other Stokes parameters entering this equation are the same quantities with the same dimension as those describing a transverse electromagnetic wave in Section 2.3.3. Radiative transfer in anisotropic clouds composed of oriented nonspherical particles is mentioned but not discussed.
8. Section 4.1.3 begs for a figure explaining the geometric-optics mechanism of rainbow formation. It is also incomprehensible how a book on cloud optics can lack a section on the numerous optical displays exhibited by cirrus clouds.
9. There is no overview of ground-based, in situ, and remote-sensing optical instruments used to characterize clouds.
10. Although there is a section titled "Clouds and Climate", the coverage of this important subject is grossly insufficient.
11. There is no section on the International Satellite Cloud Climatology Project which has been the main source of information about the long-term global distribution and properties of clouds.
12. There is no subject index at the end of the book.

This list can be extended.

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Despite these deficiencies, I believe that this book will be a meaningful addition to any research library since it contains a nontrivial collection of useful facts, formulas, and references and is the first research-level specialized monograph on cloud optics and cloud remote sensing. Individual professional researchers should also consider buying a copy of the book for personal use, although the price of the book does not necessarily make it easily affordable. The polygraphic quality of the book is excellent.

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